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AVIATION

Set
The Oldest American Aeronautical Magazine

JANUARY 7, 1924

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Air Mail Night Flying—A Take-off at Omaha

VOLUME
XVI

SPECIAL FEATURES

NUMBER
1

NEW GLENN MARTIN WINGS
ANNUAL REPORT OF THE N.A.C.A.
LOSS OF THE FRENCH AIRSHIP DIXMUDE
USE OF AIRPLANES IN MINE RESCUE WORK

THE GARDNER, MOFFAT CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK



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Renewing Old Pledges

THE progress in aviation made during the past year is such that the industry may well be proud. Culminating in the brilliant exhibition at St. Louis where the "test-flight traveling ever achieved by man" was done, the year 1923 has been full of noteworthy accomplishments. The construction and successful flight of the Barling Bomber and the U. S. S. Shenandoah (Zik-1) indicate the possibilities of building for size and weight-carrying capacity.

The night air mail experiments, proving conclusively that 24-hour coast-to-coast mail service is possible, lead us to hope that regular air mail service will be established in 1924.

These and other noteworthy events have made the year a full one.

But there are many things yet to be done before it can be truly said that the goal of "America First in the Air" has been

reached. More and better landing fields must be established, connecting our important centers of commerce and pleasure. The commercial air service must be extended. Our country needs it, and the success of those lines already established indicate that the public has confidence in, and will patronize, this method of transportation.

The Standard Oil Company (Indiana) takes this opportunity of renewing its pledge to do all in its power to aid the aviation industry in the future, just as it has in the past, by making available a high quality of petroleum products.

When new developments take place in engine design, we will have the proper lubricants and fuel ready and waiting as each improvement is accepted by the flyers. And, as new air routes are established, these fuels and lubricants will be made available at regular and emergency fields, just as

Stanolind Aviation Gasoline and Aero Oils

are now available at most fields throughout the middle west. These landing fields at which Stanolind Aviation Gasoline and Stanolind Aero Oils may be had are listed in our booklet, "Plane Facts," a copy of which will be sent to you free, on request. This list, together with a complete airway map of the United States, compiled by the National Aeronautic Association of the U. S. A., is furnished also in the Official Guide of the U. S. Touring Information Bureau, which is for sale at all Standard Oil Company (Indiana) service stations.

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(INDIANA)

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CHICAGO, ILLINOIS

PUBLISHER'S NEWS LETTER

The occurrence of the twentieth anniversary of the Wright's first flight in December has probably given the coming of the new year a tone clearest that should create a sentiment of optimism in aerial circles. Impatience with progress is a natural and healthy sign. Twenty years seem a long time when viewed as a passing series of months. It is only when distance gives a correct perspective or comparisons are made that this formative period will seem to have been but a preliminary or preparatory stage. The first two decades of aviation have brought such great progress that it would seem that it could truly be completed *any* day; the threshold which has been crossed is the entrance to the real advent of air navigation.

Take the first twenty years of the telephone and the electric light, or going back a little further, the steamboat, the cotton gin and the telegraph. It will be seen that while technical experiments were made, it was only the time element that could bring to these great steps in human progress the recognition and utilization that made them universal spans of utility. Fifty or one hundred years hence when the air is utilized as the prime medium of transportation and when comparisons are made with other inventions and discoveries, the period of aviation just ended will not suffer when put under the critical test of engineering analysis.

When it is remembered what the air braves did for the railroads in permitting them to operate at speeds never before thought possible and when the sudden advance in telephone and radio communication came after the discovery of the grid and the vacuum tube used in these arts, it may show how sometimes a very slight addition to a great utility may suddenly change its whole course of development. So, at the commencement of 1924, it is well to take a prophetic attitude and look into the future of aviation with a confidence that comes

from observation in other fields. Just what the magic wand of discovery that will be swung over the airplane will impact is futile to conjecture. But that it will bring that necessary impulse to make the air supreme as a medium of travel, so our doubts.

Sometimes one who has a farrowing eye in the realm of science and whose philosophy is based on his own experience can see more clearly the future than those who are so close to the present problems that they are confused by details. The man who has lived the engineering development of the telephone in this country, Mr. J. J. Carty, in speaking of the need of aviation made an assertion recently that has in it an element of perspective that will be instantly recognized. Looking down from his office on the streets crowded with vehicles of all kinds, he pointed out that the city planning of years gone by had not foresaw the needs of the present and that some new means of transportation would have to be evolved to provide for the future. With the streets inadequate for traffic, the underground possibilities limited by financial considerations and the railroads crowded to their natural capacity, his eye looked at the vacant and unutilized air above the busy city. He saw this same magic wand bringing to the problem of the city a solution that only the air can offer. It is the last resource and no demand has long remained the presence of necessity.

So let the importance that is so often the breeder of premature be infused with philosophical calm. The years soon go and with them pass the problems that have caused business. It is with that hopeful spirit that the twenty-first year of the airplane is welcomed. May its "coming of age" have a renaissance of practical impact. May the magic wand bring the realization of air transport and its wide that enduring prosperity and success that are so generally expressed in the laboratories of the spirit of a new year.

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AVIATION

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Published every Monday

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* IN FAR AWAY CHINA *

AVIATION Readers Encircle the World

The following letter has been received from Canton, China. It is typical of many that are received from readers throughout the world and shows how indispensable AVIATION is if a complete picture of the progress of American aeronautics is desired.

From an old Subscriber

"Enclosed please find ten dollars for which please renew my subscription to AVIATION. In the event that you have discontinued sending the magazine to my old address, please if possible send me the copies I have missed. AVIATION has been my greatest authority since the great-critic days of '16, as production manager of ———. While building airplanes during the war and later as field manager of a division of the Air Mail and now as aeronautical adviser to Dr. Sun Yat Sen in far away China.

"I have been a subscriber to your magazine since it was first published, in fact, I still have my first copy, now seven years old as well as all copies up until the time I came here.

"I have certainly derived great pleasure and much valuable information from your indispensable paper."

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THE GARDNER, MOFFAT CO., Inc.
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Trade Mark

NATIONAL AIR

Independent authorities agree that the airplane is now ready for commercial transportation. A Martin Bomber, for instance, carrying 1600 pounds in addition to passenger weight, recently developed an average speed of more than 114 miles per hour.

Railroads have worked for years to clip minutes from their schedules. Present policy is even reducing rather than increasing speed. Travel by rail seems to be fixed for a long time to come

at 60 miles per hour.

How will the development of the airplane affect the country? The railroads welded a loosely federated group of states into a nation. How closely knit will this nation become when its very air is nationalized?

Martin men not only feel the responsibility of maintaining their own leadership - but also the obligation, and the privilege, of building soundly for a whole people.

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EDWARD P. WAGNER
EDITORIAL
ROBERT H. LIVING
CONTRIBUTING EDITOR

AVIATION

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JANUARY 7, 1934

No. 1

The Dixmude Disaster

THE wreckage of the French naval airplane Dixmude, formerly the Zeppeola LVE, with the probable loss of the gallant crew of fifty men, brings the airplane once more under critical discussion. The acute sympathy of the world was sent to the grief-stricken French naval air service, and they shared in its sorrow more wholeheartedly than the American airplane community which still transcribes the long history lists of the XRE and the Horsa. Captain Dixmude and his crew died as martyrs to the cause of air navigation. It remains for the survivors to drive the lessons which will prevent, as far as is humanly possible, a repetition of such a catastrophe.

But circumstances surrounding the disappearance of the Dixmude are still too obscure to give any basis for determining the cause of the wreck, but from what is already known it is possible to make some conjecture as to its probable cause.

For one thing, it would appear that the French naval airplane offers more rather over-confidence in the existing reserve of the Dixmude. To take an airplane of this size on a flight of several thousand miles length with only one landing and no means made available for emergency landings, is obviously taking great chances with human construction. Thus, the practical value of adequate and reliable emergency ground equipment as required for airplane operation is made evident. While airplanes are in a large degree made airplane insurance to the consequences of engine failure and independent of ground conditions, we fear that these features have been rather over-emphasized in making a case for the airplane.

Another very important point raised by the loss of the Dixmude concerns the training of airplane crews. Airplane pilots are not trained in the handling of fire balloons, but it seems to us that this training should be extended and include not only balloon knowledge but also the knowledge of the use of the airplane as a fire balloon. The knowledge of the use of the airplane as a fire balloon is not only a valuable asset in the event of engine trouble, but it is also a valuable asset in the event of engine trouble.

The question of hydrogen versus helium is another subject made timely by the loss of the Dixmude. It is not natural that airplane pilots should want every possible equipment that will increase the performance of their ship, and that is so doing they are prone to give secondary importance to the question of safety. Hydrogen, they argue, goes to 18 per cent more lift than helium. They further argue that the gas saved from the ball in the course of ascension—if it be hydrogen—can be burned in the engines as supplementary fuel, thereby the training range of the ship is considerably lengthened. Finally, the claim is made that except in war time very few airplanes have been burned as the direct result of hydrogen becoming ignited.

Omitting the importance of the two points first named, it

seems to us necessary to deal with the third point somewhat in detail. It is true that in cases where airplanes escape fire in flight or in the ground, hydrogen seldom was the primary cause. More ships than not, the gasoline stored on board in large quantities was responsible. However, and this is the crux of the problem, hydrogen was actually the secondary and final cause of the destruction of these airplanes. Gasoline is a highly volatile and inflammable liquid. Yet on airplanes fire due to the ignition of the gasoline tanks has become a more occurrence. The reason is that a generally can be located, for an airplane gasoline is the only source of fire hazard. On airplanes, filled with hydrogen, once a fire occurs in the gasoline tank, it can hardly be located for there is present a huge amount of gas, even more inflammable than gasoline, held in porous containers from which it continuously seeps into the surrounding air.

Here, the proposition is clear cut. Consideration of safety can decide but two courses: either we believe with gasoline engines, or the use hydrogen with hours of engine yet to be developed. Any other solution of the problem seems contrary to common sense, particularly in this country, where we possess the largest helium resources in the world.

The loss of the Dixmude makes the number of modern type airplanes in existence to three—the French Mittermude, the Italian Eperon and our own Steamships, all of which are of the Zeppeola type. The natural and healthy reaction now will be to limit their activities to the purposes for which they are best fitted. In the construction it is interesting to quote from a speech made by Admiral Moffet at St. Louis, in speaking of the building of the Steamships: "The ship."

"We were not so sure as to the military or naval use. There may be some question about that, but I do not think there is any question about it. That we should build these ships, but we wanted to find out definitely, if what we claimed for them is true. We had spent \$5,000,000 on the production of the ship, and so much more at Lakeland in building the hangers, so it was worth while to find it and find out. That is what we are trying to do now, to find out if these ships are practical."

From this statement it will be seen that the Navy has a two million dollar investment in the Steamships, and it is still an open question whether the ship has naval use, or not. Before this expensive experimental development is ended in the hazardous trip to the North Pole, it would seem to be the prudent course to settle beforehand the question of its value in war or peace.

It is still too soon to take on the obsolescence of postponing the proposed North Pole flight of the Steamships. But it seems pertinent to emphasize the point that every bit of aerial and military experience should be obtained from this ship before the risk is taken on an extremely hazardous flight into the frozen wastes of the North Pole.

Interesting New Glenn Martin Wings

Medium Thick and Thick Aerofoils of High Efficiency Recently Developed

LESSITER G. MILBURN
Chief Engineer, Glenn L. Martin Co.

Wing sections having a reverse curve on the bottom side, between the wing boxes, varied the downward depth of the rear boxes, and sometimes gave trouble in the design of the internal drag bracing. Both of these difficulties are encountered with sections of the type USA27.

The primary reason to overcome this difficulty seemed reasonable, and efforts were made to produce a wing section of good properties, which would be more favorable in the respects mentioned. It was, at the same time desirable to improve the high speed characteristics, and, if possible, the maximum lift coefficient.

How Wings Were Developed

The alteration of the shape of any given wing section, without materially changing its aerodynamic characteristics, can be best accomplished by having its mean camber line shape changed. This is well illustrated by a comparison of Götting

to other per hour units for ready comparison with American tests, and are given in Fig. 2.

It is seen that the Glenn Martin No. 15 has a slightly greater lift coefficient at all angles of incidence, and consequently a better lift/drag ratio over the high speed range (4 deg. to 12 deg.). At the upper rates of 6, and 10 ft. per sec., the effect is shown in an improved L/D in the range mentioned. At equal rates greater than 6, this effect is slightly increased, since the section-drag does not change with aspect ratio.

It will be noticed that at equal values of lift coefficient in the high speed range, the center of pressure locations are about the same for the two aerofoils.

The change in the shape of the mean portion of the section from the sharp kink in the mean camber line of the Glenn Martin No. 15 is brought about principally by the camber-line method of thickening. The result is the elimination of unnecessary section-drag at low lift coefficients, without detrimental effect upon L/D . In the present case, the maximum lift coefficient has been slightly increased by slightly altering the mean camber line near the rear of the section.

Comparing the actual values of lift and drag coefficients obtained, it should be borne in mind that the tests given were made at speeds of about 60 mi./hr., with wing chords of nearly 8 in. Recent tests have indicated that the maximum

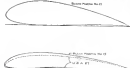


Fig. 1. Cross sectional views of the new Glenn Martin high performance wings.

per aerofoil Nos. 438, 441, 454 and 455. The thickness, and reverse shape of these sections vary considerably, with only slight changes in the camber distribution. The most recent method of increasing or decreasing the thickness of aerofoils, without altering the mean camber, consists of describing circles whose centers lie along the mean camber line, and whose tangents are tangent to the upper and lower contours of the aerofoil. Multiplying the radii of all the tangent circles by a constant factor then results in a thicker or thinner aerofoil.

A study of the USA27, modified by the mean camber line method, given above indicated that its only possible features could be eliminated without unduly altering its desirable characteristics.

Suitable features were chosen, and new sections plotted. To further increase the general efficiency, some slight alterations were made to reduce the section drag at low lift coefficients. One of the sections, Glenn Martin No. 15, is shown with USA27 in Fig. 3, where both sections are referred to a common tangent to the lower camber. It will be seen that the mean curve in the lower camber line has been partially removed and the section thickened throughout. The new part of Glenn Martin No. 15 is also of more favorable shape for high speed conditions.

Ordinates of the new section were furnished to the Göttingen Aerodynamic Laboratory, where the wing model was made and tested. In order to give direct comparison, a model of USA27 in the same scale, was also made and tested at the same speed (40 mi./hr.). The results have been transcribed

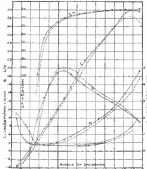


Fig. 2. Aerodynamic curves of the Glenn Martin No. 15 (full line) and USA27 (broken line) wings. Göttingen test No. 1674. Wind speed 67 mi./hr. Span, 120 cm. Chord, 20 cm.

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A Timely Warning

In a letter recently sent to President Coolidge R. H. Platt of the Consolidated Aircraft Corp. gives an interesting statement of the present very serious condition of aviation in this country.

The following is quoted from Mr. Platt's letter:—"While from the sportsman's viewpoint our country appears to lead the world in that we hold almost all records for speed and endurance, it is nevertheless a fact that these records suggest that our progress is only a small part of what is needed to meet an emergency not only as to design and performance, equipment and interior when compared to those of England and France, but are actually so old, as to date of original construction, that their continued use cannot fail to mean within the near future an epidemic of fatal accidents."

"Large appropriations have been made in order to have these changed with the equipment of our Army and Navy Air forces in use practically all available funds in developing, remodeling, and rebuilding these old machines in order that such few pilots as we have might keep in practice."

"Large appropriations would permit the development of promising experimental models the basic design of which is founded on more recent knowledge and, after such a period of development that probability is assured, the construction of the best of these types which would then be equal or superior to those in Europe."

"Appreciable money in an emergency will not stop a flood already on, nor can the halting of a stream ever be hastened by getting three under a dam. There will be no 'most war'—against a nation prepared, by the intelligent equipment of a well-equipped air-force, to step a war shortly after its beginning."

"But there is no time to develop naval equipment after a war is on. The best combat brought forth the last air strategy was the sinking of the Lusitania. The sinking of the Lusitania and the country is now paying the bill, but all our money and money brought to the front only a few undeveloped airplanes and a nation-wide investigation to determine what happened to the Lusitania."

"During your administration do you want to see the Army and Navy Air forces lose their flying efficiency because of lack of attention to the development of a stream ever to be hastened by getting three under a dam. There will be no 'most war'—against a nation prepared, by the intelligent equipment of a well-equipped air-force, to step a war shortly after its beginning."

"A few months wisely expended over a term of ten years on development work in aviation will make the world think many times before leaving us again alone and will be the far more to the advantage of our country than any other expenditure which by that time will be better than ground travel and relieve the congestion on our already overcrowded roads."

New National Records

The following altitude and duration records, established by Loren Harold H. Hays, A.S., at Wilbur Wright Field, Dayton, Ohio, Oct. 25-27, 1923, have been officially recognized by the National Aeronautics Administration as records.

ALTITUDE—5000 FEET (WHEELS LEAVING GROUND)			
Plane	Del. 25, 1923	Altitude	
Boeing Stearman	1. White	5000 ft.	2:12.0
Plane	Oct. 26, 1923	Altitude	
Boeing Stearman	1. White	5000 ft.	2:12.0
DURATION—5000 FEET (WHEELS LEAVING GROUND)			
Boeing Stearman	1. White	5000 ft.	3:18.10
Boeing Stearman	1. White	5000 ft.	3:18.10
DURATION—5000 FEET (WHEELS LEAVING GROUND)			
Boeing Stearman	1. White	5000 ft.	3:18.10
Boeing Stearman	1. White	5000 ft.	3:18.10

Since these records marked the existing world records for aerial endurance, the Bureau of Standards' official report on the records is being published in the form of a pamphlet. This pamphlet, which is being distributed to all aviation circles, has been submitted to the International Aeronautics Federation for homologation as world records.

lift coefficient of USA27 is less at 60 mi./hr. than at 20 mi./hr. with 3 in. chord.

Summary of Results

To sum up the above results, it appears that Glenn Martin No. 15 permits the use of much stiffer, stiffer boxes, and better internal drag bracing, and at the same time affords a greater high speed and a reduced landing speed. This wing is a result, has a speed range superior to any non-adapted wing at present in general use.

The greater depth of section was, he used either to produce lighter boxes or a heavily loaded wing, or to increase the gas without increasing the number of airplane bays. When the latter course is followed, a more favorable result is obtained without increasing parasite resistance. The advantage was made use of in our recent Mid-plane and biplane designs, with favorable effect. Flight tests of these airplanes afforded an opportunity of checking the maximum lift coefficient. With a wing loading of 6.5 lb./sq. ft. a maximum flying speed of 51.6 mi./hr. at 2000 ft. has been compared over a measured course. The actual landing speed is a little lower.

Another Aerofoil

Another interesting aerofoil is shown in Fig. 3. This wing section was developed during a series of tests which we conducted in order to produce an aerofoil of sufficient depth to accommodate very stiff internal bracing, without sacrificing high speed. The section drag at lift coefficients in the high speed range is remarkably low, and is less superior to many thicker wings. At the same time the towing moment is not excessive. The maximum lift coefficient is excellent, while the range of flying angles is much greater than usual. For example with a given horsepower, if the wing be loaded to fly "level" at lift coefficient 6.0000, the curve from "level" to "stalling" is made in less than 20 deg. Furthermore the drag of this wing section when landing is greater than usual.

Annual Report of the National Advisory Committee

Importance of Air Mail Service and Aeronautical Research Emphasized in Report

The most recent report of the National Advisory Committee for Aeronautics, was introduced in the 75th Congress, Cambridge by Dr. Charles D. Walcott, chairman of the committee. In the letter of introduction Dr. Ames writes among other things—

The Year's Progress

"During the past year there has been remarkable progress in aeronautical knowledge. A report of this progress has been submitted and is now available for the study of the Army and the Navy. The Air Mail Service, by flying through the night on schedule, has demonstrated that, as soon as authorized, a regular transcontinental mail service within 36 hr. can be given the American people. The committee's evidence of aeronautical progress since the armistice would, if fully represented, stir the imagination of the average people, especially American boys, for air navigation is an improved means of transportation, is destined to become as revolutionary as air is indispensable as the automobile.

"The report, however, is also becoming a more vital ingredient of war. Aviation will be the first branch of either the Army or the Navy to come into action in the future, and supremacy in the air will be practically essential for ultimate victory. With this in mind, and recognizing the need for improvement in governmental expenditures generally, it is the judgment of the National Advisory Committee that the support of the Air Mail Service is withheld from the Air Service of the Army and the Navy the funds necessary for their development and for their adequate equipment and maintenance."

The Chief Executive sent the report to Congress on Dec. 20, with a message from which the following is quoted—

"The activities of the Committee in regard to the construction of the Committee's report, which contains constructive recommendations for the advancement of aeronautics, civil and military, and especially in realizing the recommendations of the National Advisory Committee for Aeronautics for the establishment of a Bureau of Civil Aeronautics in the Department of Commerce. I desire to see the Committee's work as the basis of scientific research and the improvement of procedure for continued development of military and civil aviation of America is in large measure of other nations."

The report outlines the activities of the Committee for research and development, the scientific study of the problems of flight. It divides into individual organization, comprising as follows: Committee and those standing technical information that meet periodically. It appears that not only do the scientific members of the committee serve without compensation, but the members of the subcommittee serve as such without compensation. The membership of the subcommittee—(a) that of the main Committee comprises Army and Navy officers, representatives of the scientific community, and representatives of the Bureau of Standards and the Langley Memorial Aeronautical Laboratory.

The N.A.C.A. Committee

The membership of the main committee of the N.A.C.A. is as follows—

Charles D. Walcott, M. D., Chairman, Secretary, Smithsonian Institution, Washington, D. C.
D. W. Taylor, D. Eng., Secretary, Washington, D. C.
J. S. Ames, D. C., Chairman, Executive Committee, Director, Physical Laboratory, Johns Hopkins University, Baltimore, Md.
G. E. B. Rogers, M. D., Director, Bureau of Standards, Washington, D. C.
W. H. F. Durand, Ph.D., Professor of Mechanical Engineering, Stanford University, Calif.

Jerome C. Hunsaker, Commander, U.S.N., Director of Aeronautics, Navy Department, Washington, D. C.

Charles F. Mearns, M.E., Chief, United States Weather Bureau, Washington, D. C.
Major Lawrence T. McHenry, U.S.A., Chief, Engineering Division, Air Service, Dayton, Ohio.
Rear Admiral William A. Moffett, U.S.N., Chief, Bureau of Aeronautics, Navy Department, Washington, D. C.

Major Gen. Mason M. Patrick, U.S.A., Chief of Air Service, War Department, Washington, D. C.
S. W. Stratton, Ph.D., President, Massachusetts Institute of Technology, Cambridge, Mass.
Orville Wright, D.S., Dayton, Ohio.

Cooperation of Army and Navy

The report indicates that the Army and Navy Air Services cooperate freely with the Committee. In fact, many of the items of research recently completed by the Committee in its own laboratories at Langley Field, Va., are undertaken at the request of the Army or the Navy.

The report shows that the Committee made a careful analysis of the plans and specifications of the Navy rigid airship U.S.S. Shenandoah (formerly the ZR-3), and is now engaged in making a similar investigation and study of the Army rigid airship H-35, now in course of construction at Akron, Ohio.

Public Interest in Technical Investigations

The annual report contains full reports of the standing technical committees on Aerodynamics, Power Plants, and Materials for Aircraft, showing in detail the technical progress made during the past year, which will be printed in the design and construction of better airplanes within the next year or so.

A brief description of the results of all fundamental aeronautical research is embodied in the program of the individual publications issued by the Committee during the past year.

An evidence of the increasing general interest in the study of the science of aeronautics, the report of the Committee's Office of Aeronautical Intelligence shows the distribution of 12,000 individual requests, 3,000 technical requests, 1,200 technical requests—all issued by the National Advisory Committee for Aeronautics—and 8,000 non-technical requests for papers secured from all parts of the world. The Committee received 1,000 individual requests for technical information, in addition to numerous telephone requests, and a total of 18,000 requests of all kinds were forwarded upon request.

Fundamental Purposes of the Air Mail Service

The report contains a complete statement of the fundamental purposes of the Air Mail Service, submitted to the late President Harding at his request. In this report, the report states—

"The National Advisory Committee for Aeronautics of the Air Mail Service is the value in the Nation of the Air Mail Service, a practical means for solving the deep-seated problem of commercial aviation, as well as a means for expediting the transportation of the mail. We cannot shut our eyes to the fact that, in the future, the Air Mail Service will be the most important means of progress the American people will demand a more or less general use of aircraft in the near future for speeding the mail."

The National Advisory Committee for Aeronautics strongly recommends the granting by Congress of liberal appropriations

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to be in the Air Mail Service, sufficient to enable it to—

(a) Demonstrate that night flying is practicable over a regular route and schedule. This includes development of a class of emergency landing fields, adequate lighting for night flying, improved methods of navigation through fog, storms, and darkness, and a specially limited compass.

(b) Bring about the development of an efficient type of airplane for this special purpose, as distinct from military purposes, and perfect methods for protecting the mail from damage by fire or crash."

Notion of a National Asset

Increasing the question of defense for airports, the report states—

"During the past year, for the first time, service airplanes have actually been infused with helium. The Navy rigid air-



Governor aircraft activities—Two interior views of the factory of the Warner Metaldehyde Co., showing several types of aluminum flying boats in various stages of assembly.

ship U.S.S. Shenandoah, and a number of Army emergency craft are now being inflated. The improvement in the method of its inflation, referred to in the Committee's report of last year, has been made, and when further perfected will permit the production of helium at a much lower cost.

"Given covering before an accurate estimate of the quality of helium can be made, it is probable that the helium industry will be able to produce helium at a much lower cost than is now being produced. Even if any large-scale production of helium is not undertaken at this time, America should not neglect the existing natural resources. The National Advisory Committee for Aeronautics, therefore, strongly recommends that Congress provide for the acquisition and leasing by the Government of the largest and best helium fields.

Following are extracts from the report on the relation of aeronautical research to national defense, and the conclusion of the report, commencing American aeronautical development of popular interest during the past year.

Aeronautical Research and National Defense

"Despite the progress that has been made in aeronautics, as we at this time can hardly predict its future as its limitations, other the progress of war or commerce. As to our national defense, the progress of the Army and Navy are subject to change from year to year and are dependent in large part upon the progress of aviation. And the progress of aviation is in turn dependent upon aeronautical research. The fact that the limitation of armaments conference placed no limitation on the development of aeronautics for military purposes is a grave mistake, and a grave mistake in future warfare, whether over land or sea.

"With the increase in expenditures in the maintenance of the military and naval air services, especially in view of the

aggregate cost of new types of aircraft, it is more than ever necessary that fundamental information should be available, so that the progress of war or commerce is based. The Army and Navy rely upon the National Advisory Committee for Aeronautics for the fundamental aeronautical information necessary for the design of military and naval aircraft.

"To keep pace with military developments abroad as well as to keep the day of practical commercial aviation in this country, more knowledge is necessary on the fundamental problems of flight. The committee from year to year has carefully prepared its research programs, and has invariably had to modify or delay these programs for lack of funds. The committee feels that the establishment and postponement of its research programs mean the delay to the American people of knowledge necessary for the substantial development of aviation, civil and military, even though several appropriations



be made, as they should be, for the Army, Navy, and Postal Air Services.

"The committee appreciates the need the economy in Government expenditures at the present time, but the continuous advancement of aeronautics (which means) demands upon the committee the new knowledge, which can be obtained only by the conduct of scientific research.

"The committee believes that the development of aeronautics will promote our national welfare, improve our national defense, and make secure our national defense. When considering the costs involved, it should be considered that scientific research in the best (research) obtainable to prevent waste of funds through the design and construction of aircraft which are not suitable for the purposes intended. The air service of our Army and Navy are not so large as those of other world powers, but we are gradually finding that of other nations in our knowledge of the scientific principles underlying the design and construction of aircraft, and in the important respect of least we are proceeding against superfluous in the air.

Conclusion

"During the past year there has been a gratifying increase in knowledge of the science of aeronautics, as fully described in the reports of the technical subcommittees, and in the annual publication of the National Advisory Committee for Aeronautics. The year to year must testify before the reality of fundamental research being evident in the construction of better aircraft. Justification of the policy of continuous progress of aeronautics research is a national American achievement of more popular interest during the past year, among which may be mentioned the following:

(a) The two-day test demonstration by the Air Mail Ser-

The Making of Greater New York's Air Map

Planes Flew 3000 Miles and Photographed 625 Square Miles
on Largest City Mapping Project Ever Attempted

The world's greatest aerial photographic mapping project, covering Greater New York has almost been completed by the Fairchild Aerial Camera Corp. of New York. About 3000 mi. were flown and the entire greater city of five boroughs—Manhattan, Bronx, Queens, Brooklyn, and Richmond, a territory of approximately 625 sq. mi.—has been mapped. Two thousand exposures were necessary to cover the large area. Thirty planes were over the city whenever there was a good photographic day.

What the Photographs Show

The contract for the tremendous mapping work was awarded to the Fairchild Company on July 29, 1933. It calls for delivery of the completed map by April 30, 1935.

The camera used exclusively on this work was the Fairchild automatic aerial camera with the "between-the-lens" shutter. It weighs 30 lb. It covers a 1000 ft. strip of the ground from a height of 10,000 ft. The camera is mounted on a special frame, examples of automatic precision machinery over made. This is the official camera of the U. S. Army and Navy, the Canadian government and the Brazilian government.

The company has fifteen cameras in operation, checking terrain and assembling the maps, working in cooperation with an inspector from the City Engineer's office. The map pictures the city with the greatest detail. It shows every structure, the contractor's language, the street, the construction in progress on the skyscraper, the bridge, the park and every tree and bush visible, avenues and alleys, streets and unimproved foot paths, big league ball parks, water, front yards, with their yards and motor boats, the hundreds of cars, islands, and crowds of people appearing like small black dots. Even the congestion of traffic on busy thoroughfares is clearly shown.

Two Air Maps Made

Two distinct camera angles are being made from the aerial photographs. The first shows an area of approximately 600 sq. mi. within the official city limits at the scale of 1 in. = 60 ft., this is to be delivered in 140 sections, each section being about 34 in. square. This is to be made in a series of strips, to correspond with the 35 vertical film strips. The second is to be made in the Board of Estimate and Appeal office. This will be used in connection with these official maps. It made in one section, the map would measure approximately 22 ft. by 34 ft.

The second map is being made at the scale of 1 in. = 2000 ft., and covers an area of about 625 sq. mi., including the city proper, the five boroughs and also portions of the surrounding territory. The first map and the second map will be made at 10 ft. by 10 ft. and 10 ft. by 10 ft. The larger area will be mapped at the scale of 1 in. = 600 ft. The dimensions of the map would be about 27 ft. by 34 ft.

Interference of Weather

Few days are suitable for photographic mapping work as there must be 70 mi. clear sky and no clouds. Even with clouds and clear skies, the weather is not always ideal. The company has been forced to postpone at least five times. This requirement proved a difficult proposition as the time is not to be later than 2 p. m. or 4 p. m. when other conditions are favorable. In one instance there was a start of several weeks, but a sudden shift in the weather of the day. It was also impossible that flying be completed before noon on any day. Some of the work for the map was done at 3000 ft. altitude, using a short focal length camera to take photographs at a very small scale for checking controls. The start of each photographic

flight was made from the Fairchild hangar at Curtiss Field, Garden City. Frequently the photographic sessions started on rather weather conditions that seemed suitable only to be completely ruined when the planes were in the air. The company is often without pictures on account of haze or cloud formations.

It is interesting to note that if the 2000 exposures to cover the entire area with an allowance of 50 per cent and 50 per cent side overlap were made together they would make a single strip map covering 600 linear miles on the ground, and such a map if in one section at the scale of 1 in. = 600 ft., giving effect to the aerial at 50 per cent would be nearly 800 ft. long.

It was the Fairchild mapping division at present at top speed. The company had to maintain a machine shop in order to construct the machinery for this map and all instruments were developed and built for this ambitious undertaking by Fairchild engineers. The map scale for the ground accuracy. Negatives showing very small details of land have to be enlarged in the printing process so that the 140 in. covered in the prints. All prints have to be brought to the required scale and it is therefore to do this a different ratio of enlargement and reduction is required for practically every print. This requires a fine adjustment of the enlarging camera.

It was the first mapping contract that the Fairchild company has done for the City of New York. Two years ago the company took aerial photographs for a best fire railroad survey, and a year later it mapped Manhattan Island on a small scale. The latter map is reproduced here. Coney Island and the New Queens Boulevard were also mapped. With a crew of engineers numbering more than 500, with the finest of mapping maps of every description, New York City engaged a detailed task when it wanted to visualize its ever-growing problem to non-technical officials and to the public. The aerial map solved the problem.

In his recommendation to the Mayor, Arthur H. Tamm, City Engineer, said that the aerial map was the most important. The numerous advantages which an aerial map of the entire city would afford in the study of municipal problems are too apparent for discussion."

The flying activities of the firm in connection with aerial photographic work have covered the following States: New York, New Jersey, Connecticut, Massachusetts, Delaware, District of Columbia, Virginia, Maryland, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Kansas, Minnesota and Texas. There have been no aerials in the last map and also portions of the past year's expenditure. During the past season a total distance of about 20,000 mi. was flown.

Personnel and Equipment

Flying operations for the New York City map were under the direction of Richard H. Depue, Jr., Chief of the Fairchild Photo Service. The assembly work is under the supervision of Mr. R. A. Lester, former pilot in the Canadian Air Force and lieutenant in the Canadian Army, now manager of the mapping division of the Fairchild company.

Five expert aerial photographers are attached to the Fairchild Photo Service. Lewis McPherson, who is Pilot, Robert J. Smith, formerly Chief of the Bureau of Aerial Photography, who is a former member of the Royal Air Force; R. J. Brown, formerly of the 11th Photo Section of the Air Service, and David M. Lang, at Dallas, Tex.

The sales department, under the direction of Jack B. Deeks, who is a former member of the staff of eight men operating from the New York office.

The plants operated by the company include two Standard J's with C-6 engine, a Curtiss M-2 flying boat with C-6 engine, and a Fokker C-2 with B.M.W. 350 hp. engine. The

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Standards and the M-2 are used from the Curtiss Exhibition Co., while the Fokker is owned by the Fairchild company.

The expenditure has grown from a nucleus of four men, many today about 100 men are employed in the aerial, flying photographic and manufacturing divisions.

Whenever possible, Fairchild engineers, desiring to stimulate commercial flying, assist in such work with the company who have planes adaptable for their work. This gives the expense of cross-country flying, and side materially in reducing the total cost to the customer.

In New York State this past season, 22 contracts were successfully completed between Rochester and Albany (including Rochester). That large manufacturing companies

Wetzel and Power Co. of Baltimore, the Dupuyne Light and Power Co. of Pittsburgh, and the Ohio Public Service Corp. of Cleveland, have used aerial photographs and found them accurate and a great help in their work.

In Ohio a great deal of oblique and history photography was completed last summer. Among the clients were the Standard Oil Co., Cleveland Trust and Building Co., Cleveland Building Co., Ohio Leather Co., National Tube Co., West Penn Power Co., Public Iron and Steel Co., and the White Motor Car Co.

In the South-West most of the contracts were for advertising purposes, but some were also secured from real estate firms and railroad companies. The most interesting job re-



Manhattan map of Manhattan Island, made by the Fairchild Aerial Camera Corp. of New York

are making the value of aerial photography is shown by the fact that the following companies use Fairchild photographs: Endicott-Johnson, General Electric, Brown-Lipe, Chicago, a subsidiary of General Motors Corp., Weber Electric Co., General Electric Co., Union Gas and Electric Co., Cohen Light and Power Co., Eastman Kodak Co. Work was also done for the Submarine Road Estate Building, and the Syracuse Post-Standard. One of the customers recently completed was for the Hamlet-Rose Foundation, which desired a map of New York. The use of soft soil by facilities around Manhattan greatly hindered this work, which took almost a year to complete. These photographs were taken from an altitude of 10,000 ft., and this was the first time that oblique photography was used as an extensive scale by a general planning board or committee.

Owing to many complaints that have been made recently about low flying by commercial planes, the Fairchild photography pilots have been instructed to avoid unnecessary low flying.

Aerial Mapping and Soft Flying

In the early days of this company, Sherman M. Fairchild, the president, found that low flying over cities was unwise. If that time photographs were taken at a short level, having a focal length of four to six ft., the results were not as good as the Fairchild photographs have been of 20 ft. focal length. This became enable them to secure photographs at altitudes varying from 2000 to 3000 ft., thereby preventing the violation of the City ordinances against low flying.

Other photographic experts went to New England this summer. An extra to Boston from Garden City, L. I., oblique photographs of New Britain, Conn., and Worcester, Mass., were taken for the use of the planning boards of the respective cities. Oblique photographs covering all of Boston were taken by the Chamber of Commerce and the City Planning Board. While they were over the territory the industrial plants of the Boston Engineering Company at Hartford, the Brown Electric Company at Bridgeport, and the Standard Armory of Springfield, Mass., were also photographed. The plane was piloted by R. C. Latta, and the photographic work was conducted by Lewis McPherson of the Fairchild staff.

In planning the right of way for high-tension transmission lines, aerial photographs have become extremely valuable. The Public Service Corporation of Michigan, the Pennsylvania

Electric Co. and the Pennsylvania Electric Co. have been recently completed was the photographing of a hundred mile right of way for power projects. This work was done in close cooperation with the Engineers of the Texas Light and Power Co. As no Government maps of any description were available in Texas, the engineers found that aerial photographs covering the proposed right of way were valuable in determining transmission line locations.

Mr. Fairchild personally directs the work of his organization. While the company is now engaged in the construction of aerial cameras, many of which have been sold in the United States, Europe, and elsewhere, Mr. Fairchild has been offered to private individuals or organizations. The company has not of producing them, practically makes the price prohibitive for general commercial consumption.

The approach of winter has brought no cessation in the Fairchild plans for aerial photography work. Further expansion as an even larger scale is planned for the first of the year.

As Others See Us

The following is quoted from an article headed "A Lesson from the States," which appeared in the Nov. 7, 1933, issue of *The Internationalist* (London):

"The International Air Meeting held at St. Louis in Oct. 4-10 was notable for the extraordinary results of the Pulitzer Trophy Race held on the last day. Forty machines entered, six started and six completed the 125 mi. course. The record of the race was a 100 mi. race, 215 mi. race, and the winner made over 245 mi. race. There is no need to stress the significance of these results."

"It was claimed that the meeting was the largest and most highly attended aeronautical meeting that has been held. It is said that 100,000 people were present on the day of the Pulitzer Race. Between 20,000 and 30,000 persons attended on the other two days. \$50,000 was taken in at the gates."

"In some ways these figures are more significant than the results made on the Pulitzer Trophy Race. Even the results of the R.A.P. Pageant are not equal this, and in comparison the attendance at other air race meetings are insignificant. Why was America moved in driving crowds so much larger than could be secured in England?"

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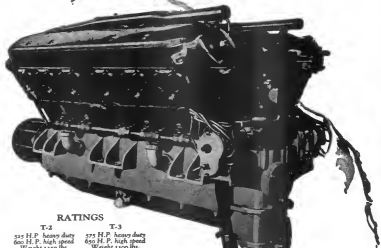
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